Develop Strategies to Meet Standards

Water Resource Protection

CWA: Total Maximum Daily Loads Antidegradation

Nonpoint Source Program

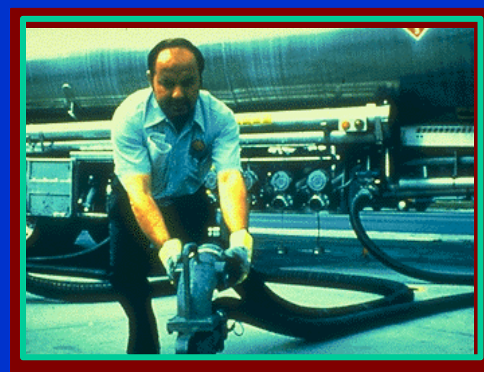
SDWA: Protecting Drinking Water Sources

- Earlier, we discussed treatment technologies for drinking water and wastewater. In addition to water treatment, there are a host of practices that can be implemented by industry, homeowners, and small businesses, either voluntarily or as imposed by Federal, State and local governments to protect our water resources.
- The Federal government has an array of regulatory programs aimed at protecting surface and ground water quality:
  - Controls on discharges from industrial, commercial and agricultural point sources under the CWA;
  - Nonpoint source management under the CWA;
  - Municipal sludge management program under the CWA;
  - Protection of ground and surface water from discharges of hazardous waste under the Resource Conservation and Recovery Act; and
  - Remediation of ground and surface water contaminated from abandoned waste disposal sites under the Comprehensive Environmental Response, Compensation and Liability Act.
- This section will look at State and local tools for protecting water resources.

- Management measures or best management practices are applicable to point and nonpoint source dischargers under the CWA and to protection of drinking water sources under SDWA. Essentially, these are measures that minimize the effects of human activities on water quality by preventing pollution.
- Although some of these measures can be imposed through Federal authority, often State and local governments have jurisdiction.
- Protection of existing sources of water is a prudent way to protect public health and keep treatment costs to a minimum. Many management measures are available to prevent pollution, control contaminants at the sources, or treat wastewater before it is discharged.
- Selection of management measures is based on a variety of factors, including the physical properties of the watershed (annual precipitation, soil type and drainage, ground water and surface water hydrology, and space limitations), land uses and potential contaminants, type of contamination problem (e.g., point source or nonpoint source), public acceptance of measures, cost, maintenance needs, and aesthetics.

Regulations and Permits

- Construction and operating standards
- Permit requirements
- Public health and nuisance abatement regulations
- Sediment and erosion control ordinances



- Management measures, water and wastewater treatment, and land use restrictions can be imposed by regulation or through permit requirements. Government officials can require owners of facilities that can endanger water resources to comply with standards for proper design, operation, or maintenance.
- In some communities, local government officials may encounter public resistance to regulations, and the cost to administer permitting or inspection programs can be high. However, regulations can be an effective way to control certain activities in sensitive areas. Most regulatory controls are subject to the provisions of State enabling legislation, and require careful drafting to avoid potential legal challenges.
- Local governments generally have public health responsibilities that include regulating:
  - On-site wastewater treatment systems;
  - Disease vectors (rodents, insects); and
  - Nuisances such as dust, odor, or noise.
- Local governments also can impose requirements to control sediments and erosion in new developments.

Land Use Controls

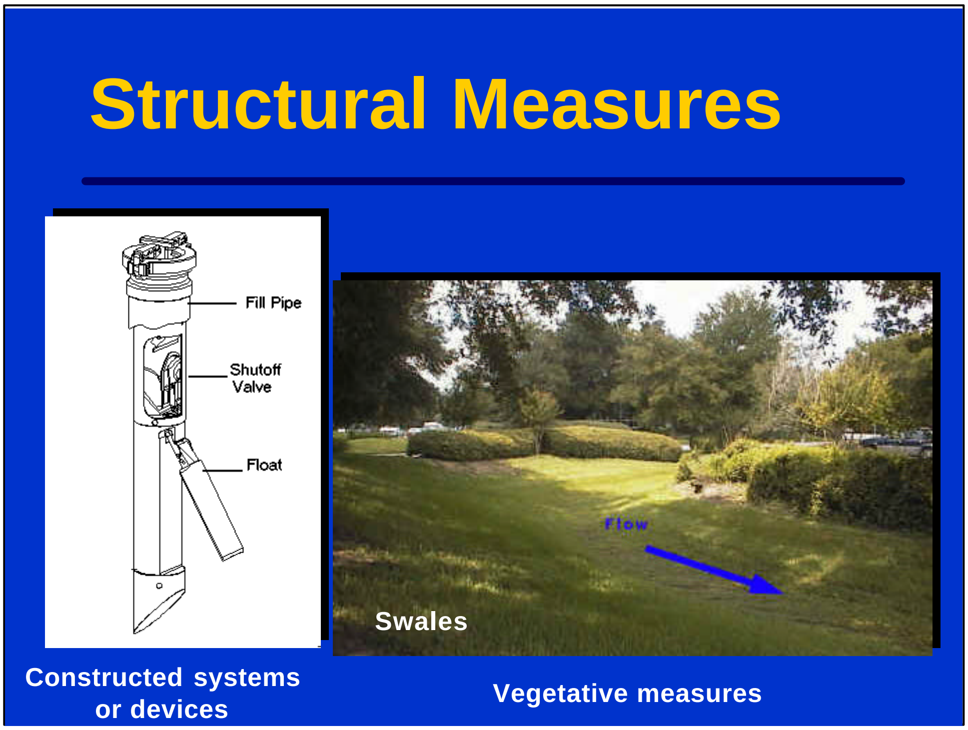
- Subdivision growth controls
- Zoning
- Land purchase
- Acquisition of development rights
- Land use restrictions

- Land uses that pose risks to water quality can be controlled or removed from sensitive areas such as watersheds of public drinking water supplies, riparian zones, wetlands, and other key aquatic habitats.
- Local government officials can use subdivision and growth controls to reduce population density, or zoning ordinances to prohibit or restrict certain activities in areas that affect water quality.
- By acquiring the rights to development on parcels of land through purchase or donation of the land, local government officials have complete control over the activities in critical areas.
- The high cost of purchasing property or development rights makes this impractical for many communities. Some States have grants for acquiring environmentally sensitive lands and non-profit organizations such as local or regional land trusts can assist communities by acquiring land. The American Farmland Trust and the Nature Conservancy are examples of non-profit organizations that focus on protection of water resources through land acquisition. USDA’s Conservation Reserve Program also manages a program to obtain easements on environmentally sensitive land.
- Often, the greatest consideration in passing regulatory land use controls is the political acceptability of limiting certain activities. However, most people consider passing zoning ordinances to be the right and responsibility of local governments, and public education about the importance of protecting water supplies can increase the acceptance of land use controls.

Public Education

- Informational meetings
- Advertisements, flyers and posters
- Questionnaires
- Demonstration projects
- Community and school events
- Consumer Confidence Reports

- Many people inadvertently contribute to pollution simply because they do not realize that their activities can contaminate water resources. Behavioral science research shows that simply providing information aimed at increasing awareness does not usually result in behavior change. A public education campaign that also speaks to values and beliefs can be effective in explaining how each business and household can protect water quality.
- Many local governments have developed public education programs designed to encourage adoption of best management practices and waste minimization strategies. These are publicized through printed materials, Web sites, and public service announcements on radio and television in newspapers.
- School events can be used to build public support and inform future decisionmakers.
- Under SDWA, the Consumer Confidence Report rule requires all public water system operators to report annually on the status of their water systems to consumers they serve.



- Structural measures refer to ***man-made systems or devices*** designed to avoid degradation of water resources. They may work by preventing leaks or contamination, or stopping them at the source; collecting or diverting hazardous or toxic components of a waste stream; or encouraging filtration or infiltration of runoff to allow natural processes to remove contaminants.
- ***Constructed devices*** or retrofits to existing machinery or operations can detect equipment failures or leaks, contain contaminants at the source, or catch spilled chemicals. Examples include secondary containment structures, leak detection devices on storage tanks, segregating floor drains from wastewater carrying hazardous or toxic wastes, such as photography development fluids, and devices to collect and store wastewater for proper disposal.
- Another constructed device is a ***storm water detention pond or constructed wetland***. Constructed wetland systems offer potential advantages, such as comparatively simple operation with low maintenance, process stability under varying environmental conditions, and low construction and operating costs when compared with traditional water treatment facilities.
- ***Natural vegetation*** is remarkably effective at filtering contaminants before they reach water bodies or seep into the ground water. It can also slow the speed of runoff to prevent erosion.
- Vegetative measures capitalize on these abilities to promote filtering or infiltration of waste water. They are often used to mitigate the damage caused by runoff over farm land, roads, or in urban areas. Examples include constructed wetlands, vegetated buffer strips along shore lines, or grassed swales or depressions that collect runoff, encourage infiltration, or reduce erosion.

Responsible Land Management

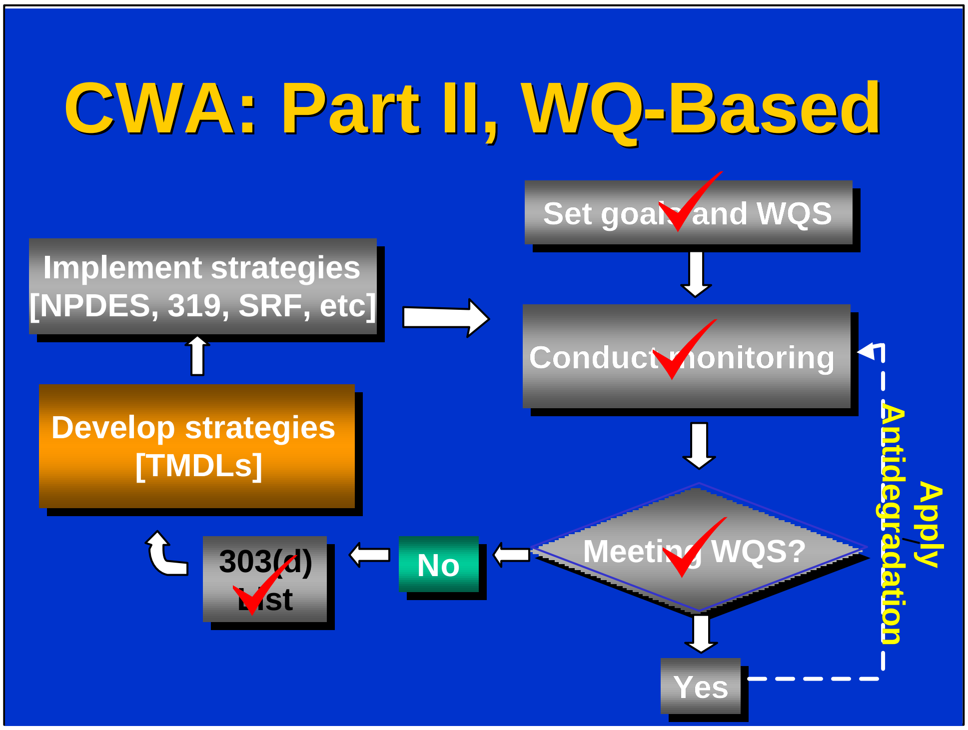
Contour strip farming

- Land owners should be encouraged to conduct activities in a manner that reduces threats to water resources. Environmentally responsible land management does not mean that people must cease certain activities or make drastic changes to their businesses, rather that they re-think the way they go about their activities. For example:
  - Environmentally sensitive landscaping relies on native plants that grow dense root systems to encourage infiltration and reduce erosion. These plants have the best chance for survival with the least amount of watering, pesticides, and fertilizers, saving the land owner money.
  - Proper lawn maintenance involves aerating soils and planting climate-appropriate species of grasses that need the least chemical assistance to thrive.
  - Conservation tillage, crop rotation, contour strip farming, and animal grazing management can protect valuable farm land and reduce loss of pesticides and nutrients to the environment and sediment.
  - Integrated pest management is the coordinated use of pest and environmental information with available pest control methods to prevent unacceptable levels of pest damage by the most economical means and with the least possible hazard to people, property, and the environment.
  - Animal waste comes from a variety of sources, the most obvious of which are livestock animals. Several feedlot management measures are available to reduce contact between livestock and poultry manure and precipitation or runoff: storage ponds or other storage facilities designed to keep rain water and runoff away from wastes and stored for later application to crops; clean water diversion using rain gutters and downspouts directed away from manure or constructing superficial diversions such as berms avoids contamination of precipitation and surface flow as it makes its way to surface water bodies; and vegetative filter strips and other means can be used to control overland flow.
- Financial incentives are available from the U.S. Department of Agriculture for some of these agricultural measures.

- ***Careful handling, use, storage and disposal*** of potentially dangerous chemicals can protect water supplies. For example, proper use of fertilizer and pesticides can prevent storm water contamination.
- Small quantity chemical users include dry cleaners, beauty shops, photo finishers, vehicle repair shops, printers, laboratories, academic institutions, water supply facilities, nursing homes, medical facilities, and many others. These businesses use solvents, corrosives, dry cleaning agents, heavy metals and inorganics, inks and paint, lead-acid batteries, plating chemicals, cyanide, and wood preserving agents, among other chemicals, in their daily business.
    - o Good ***waste reduction*** and management strategies can significantly reduce the threat of hazardous materials to water resources.
    - o ***Responsible purchasing*** can also drastically decrease the amount of hazardous waste for disposal. This includes ordering materials on an as-needed basis and returning unused portions back to vendors. The toxicity of waste can be reduced by purchasing and using the least hazardous or least concentrated products available to accomplish their processes. Such substitutions include the use of water based paints, or high solids solvent based paints when water based paints are not available. Cleaning products and solvents, which can contain highly toxic or harsh chemicals, can be replaced with less hazardous counterparts. Printing businesses can use nontoxic inks that are free of heavy metal pigments.
- Another method of waste reduction is trading waste with other businesses. ***Waste exchanges*** reduce disposal costs and quantities, reduce the demand

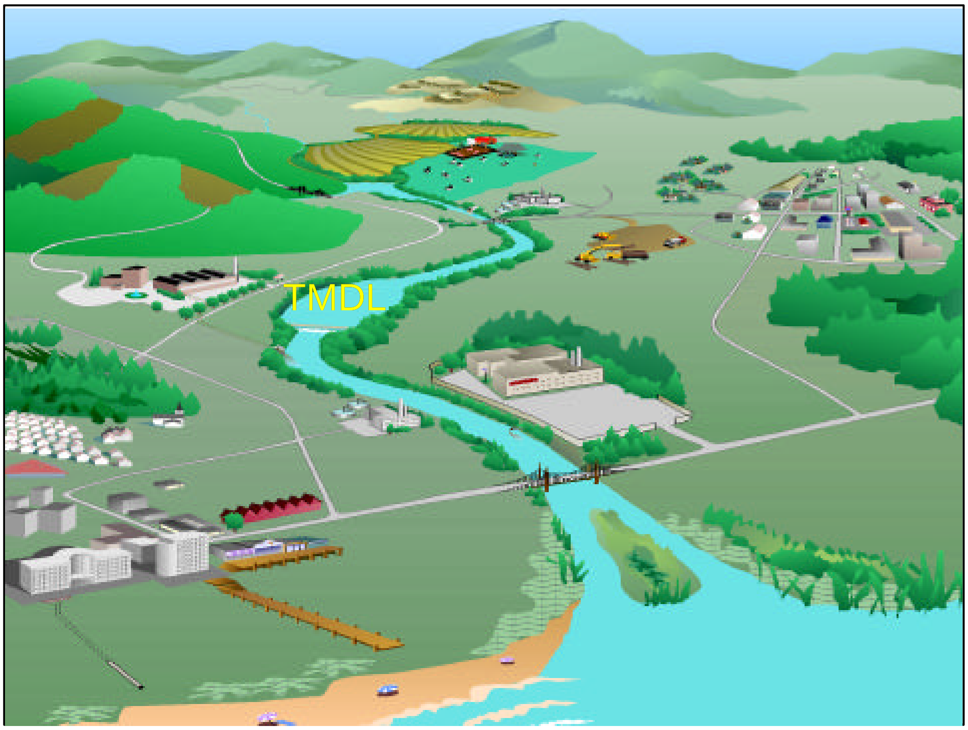

Clean Water Act
Total Maximum Daily Loads
Antidegradation
Nonpoint Source Program
The Watershed Academy

Key Elements of the CWA



• This graphic shows that after setting WQS and doing ambient monitoring to see if WQS are met, the next step is to develop strategies for meeting WQS (if monitoring reveals they are not being met).

- Here are three prominent types of integrated watershed strategies. We will spend most of our time on TMDLs, the most common watershed strategy.



- Note that “TMDL” appears in the same location as did “303(d)” in the previous version of this slide. TMDLs are required only for waters on a State’s §303(d) list.

§303(d) Process: Establishing TMDLs

A TMDL. . . .

- Is a strategy for achieving WQS
- Is based on the relationship between pollutant sources and the condition of a waterbody
- Describes an allowable load and allocates it among several sources

- Each TMDL is done for a specific a pollutant. One could theoretically do multiple TMDLs for the same waterbody in conjunction with one another if more than one pollutant was causing the impairment.
- TMDLs do not include implementation plans. They function essentially as a "budget."

Pollutant

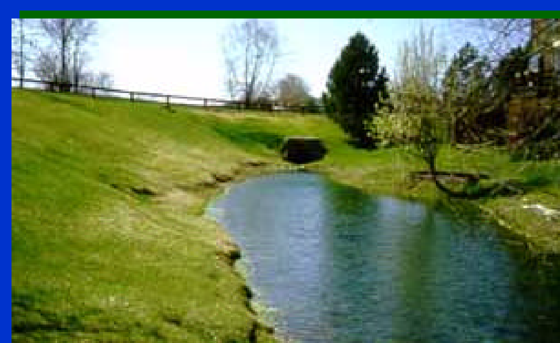
- Means dredged spoil, solid waste, incinerator residue, filter backwash, sewage sludge, chemical wastes, biological materials, (some) radioactive materials, construction debris, heat, wrecked or discarded equipment, rock, sand, cellar dirt and industrial, municipal, and agricultural waste discharged into water

CWA Section 502(6)

- The word “some” is in parentheses because the current §303(d) regulations require listing only for waterbodies impaired by pollutants (such as chemicals, heat, pH, sediment, BOD), whereas the new, but suspended TMDL rule package would also require listing of waters impaired by pollution (e.g., flow changes, invasive species, channel modification).

Pollution

- The man-made or man-induced alteration of the chemical, physical, biological and radiological integrity of the water



CWA Section 502(14)

- TMDLs are only required for "pollutants," not "pollution." Not included are activities such as:
  - o Flow alteration;
  - o Channel modification; and
  - o Moving riparian vegetation.

TMDLs

- Amount of a specific pollutant that a waterbody can receive and assimilate and still meet water quality standards
- States and tribes are required to develop TMDLs for waters on their §303(d) lists
- TMDLs are approved or disapproved by EPA; if disapproved, EPA develops the TMDL

TMDL Definition

$$TMDL = \sum_{i=1}^{n} WLA_i + \sum_{i=1}^{n} LA_i + MOS$$

ΣWLA_i: Sum of waste loads (point sources)

ΣLA_i: Sum of loads (nonpoint sources)

MOS: Margin of Safety

- Extra measure of protection due to uncertainty

- Can be explicit (e.g., 10%) or implicit (safety factors and assumptions in modeling, etc.)

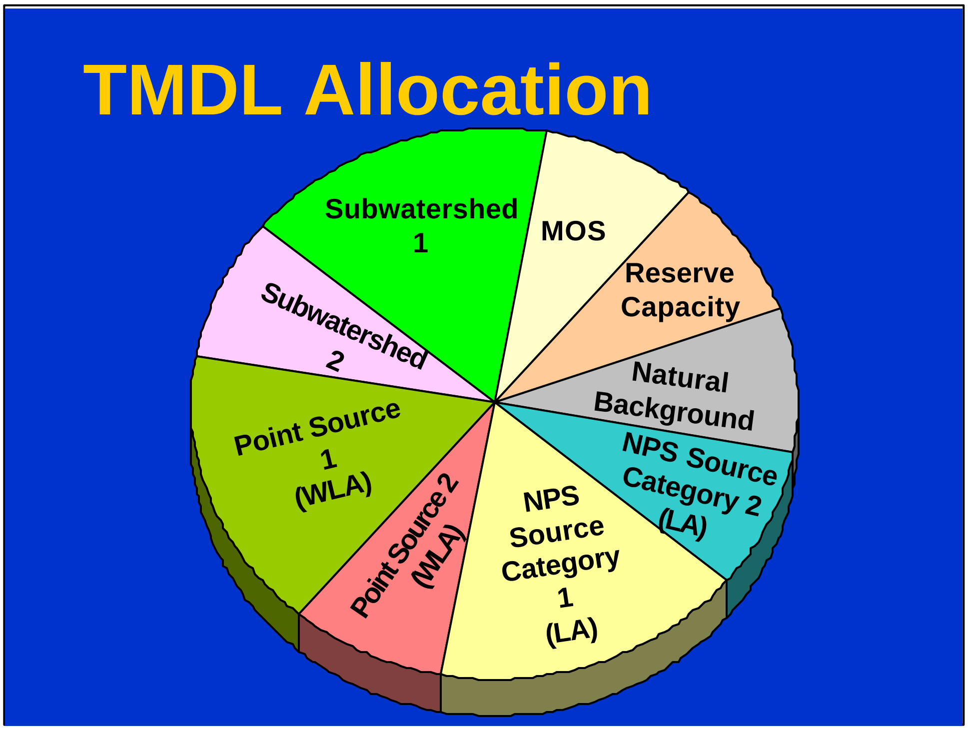
- This is just another way of expressing the meaning of TMDLs, for “math junkies” or folks who yearn for Calculus 101.
- WLA = waste load allocation; part attributable to point sources.
- LA = load allocation; part attributable to nonpoint sources.

TMDL "Caps"

- For specific pollutants
  - Sediment, nitrogen, phosphorus, temperature, copper, mercury
- For pollutant indicators
  - BOD, COD
- Not necessarily daily
  - May be weekly, monthly, yearly
- May vary seasonally

- A State could have different allowable loads for different parts of the year. For example, if the issue is DO levels in stream, a State could allow high loadings of BOD in cooler months than in summer, because oxygen holding capacity of colder water is higher than for warm water.

- Remember that States can give one overall allocation to all sources that are covered under one general NPDES permit. There will be more on general permits later, but States authorize discharges by a large number of very similar sources using just one NPDES permit.
- Nonpoint sources (NPS) of pollution are somewhat different than point sources (PS), because EPA recognizes that assigning individual load allocations to specific farming, forestry, or other type of operation is much harder than doing so for a paper mill or a pharmaceuticals plant.
- ***Key!!*** Contrary to what many presume, neither the CWA, EPA regulations, nor even EPA guidance requires or even suggests using one method of allocating allowable loads versus another method.

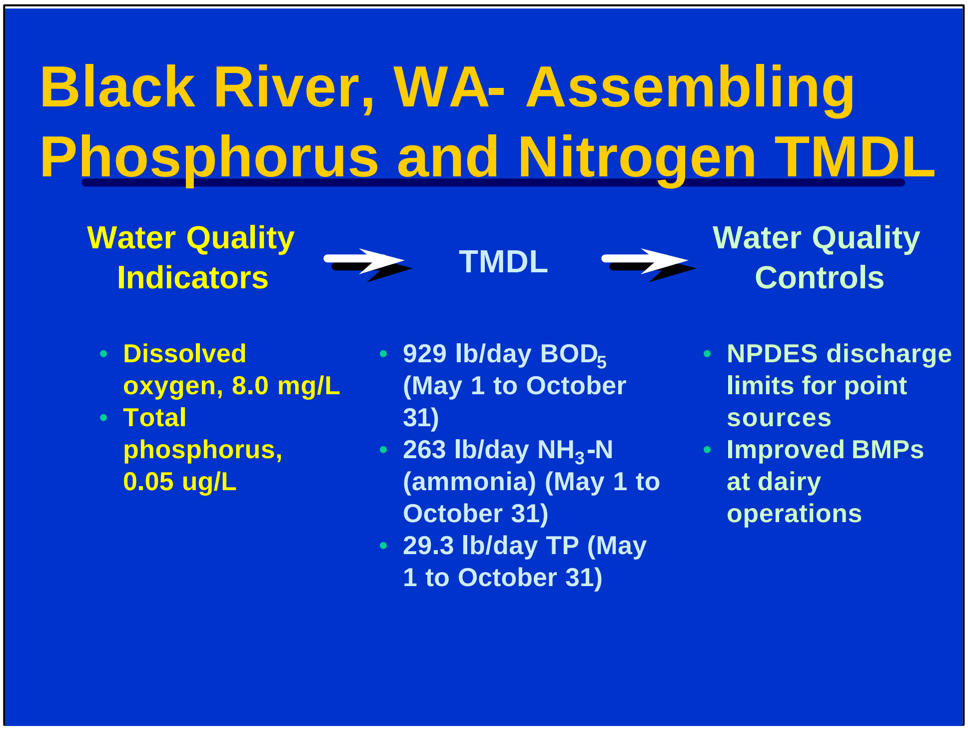


- This is a conceptual diagram, showing how loads under a TMDL might be allocated to various kinds of sources and other factors. Starting in the "1 o'clock" position, we have:
  - ***Margin of Safety***—Obviously, the bigger this slice of the pie, the less load can be "given" to current or future sources.
  - ***Reserve Capacity***—Deciding how much of the allowed load to assign to future growth and development presents some very interesting issues. There is an inevitable tradeoff between the interests of existing sources and the interests of future sources. If you set nothing aside for the future, then it will be harder to accommodate forms of development that generate new loads of the pollutant in question. But, if you set aside a relatively large amount for growth, then existing sources will get lower allocations, and therefore have to achieve greater reductions.
  - ***Natural Background***—Allocation of the total allowed load must reflect the contribution from natural sources. Failure to set aside a portion of the total allocation to reflect the actual levels of natural loads will result in an over-allocation of the waterbody and failure to meet WQS.
  - ***Nonpoint Source Categories***—The next two wedges illustrate the fact that you can assign loads to entire categories of nonpoint sources, such as all of a certain type of farming operation.
  - ***Individual WLAs for Point Sources***—Note that the amount assigned to each of these sources differs.
  - ***Overall Load Allocation to Specific Sub-basins***—This could be an option in situations where there are no significant individual point sources and the sub-watershed is not dominated by one or two categories of NPS.

Reasonable Assurances for Nonpoint Source Implementation

- Examples
  - Incentive-based, nonregulatory programs
  - Regulatory approaches
- The primary implementation mechanism may include a State's nonpoint source management program coupled with state, local, and federal land management programs

- The CWA nonpoint source program is like the SDWA source water program, in that it largely involves land use issues that are addressed at the State and local levels.
- No Federal regulatory authority over nonpoint sources is provided by the CWA.



- This slide presents a summary data from an actual TMDL. It shows how water quality standards and indicators are translated into loads in the TMDL, which in turn are converted into a set of control and management actions aimed at bringing loads down to levels allowed in the TMDL. The slide actually reflects three TMDLs, each for a different pollutant or parameter, for the same waterbody. The dissolved oxygen (DO) standard is reflected most obviously in the biochemical oxygen demand (BOD) loading rate in the TMDL. Likewise, the WQS for phosphorus is converted into a loading rate for phosphorus.
- The loading limits in the TMDL apply only from May through October. As water temperatures increase, the water can hold less oxygen in solution, so during the warm months, it is more important to limit inputs of pollutants that can reduce dissolved oxygen.
- There is a loading rate for nitrogen, as ammonia, although there is no numeric WQS for ammonia or any other form of nitrogen.
- How there could be a loading limit for a pollutant in the TMDL when there is no corresponding numeric WQC? One possible answer is that the limit on the most toxic basic form of nitrogen—ammonia—is derived from the narrative "no toxics in toxic amounts" standard. But, it's also possible that the limit on this form of nitrogen is designed to help attain the DO criterion, since excessive loads of nutrients can lead indirectly to lowered DO, through eutrophication.
- As noted earlier, the toxicity of ammonia goes up as water temperature rises, so it would be more important to control inputs of this pollutant during the hotter months; but waterbodies are also more sensitive to oxygen-demanding pollutant loadings in the summer months.
- The loading limits for each of the three pollutants are then assigned to various sources within the waterbody. The waste load allocation for point sources is translated into pollutant-specific effluent limits in their NPDES permits. Needed reductions for dairy operations are not translated into end-of-pipe discharge limits. Rather, these are expressed as an array of best management practices (BMPs) that, if properly employed, should achieve the needed reductions in loadings. These BMPs could be specified in NPDES permits for those dairies that are large enough to be considered concentrated animal feeding operations (CAFOs). Otherwise, they would be encouraged through voluntary means, such as cost-sharing and technical assistance.

Sediment TMDLs- Instream and Hillslope Targets

Indicators/ Targets

Instream:
- Median particle size >12 mm
- <15% fines <0.85 mm

Hillslope:
- Attain < 3 miles roads with erosion potential per mile of study area

Instream:
- V* < 0.2
- >50 redds per mile

Hillslope:
- Attain < 10% actively eroding streambanks

Allocations

Landowner 1:
- Reduce erosion-prone mileage by 12 miles

Landowner 2:
- Reduce erosion-prone road mileage by 5 miles

Reduce length of eroding banks by

Tributary 1: 25%
Tributary 2: 5%
Tributary 3: 10%

- The level of detail in this TMDL probably creates a greater chance of success than a less-detailed TMDL.

WQS: Antidegradation

- Purpose: Prevent deterioration of existing levels of good water quality
- Two basic rules apply to all high- quality waters
- More stringent rules apply to specially designated waters

- Antidegradation's purpose is to keep waters that are better-than-standards for at least one pollutant or parameter in attainment with the relevant standards, uses, and criteria.
- If only one of several designated uses is being attained, or only three out of 30 (for example) WQC are being met, antidegradation applies to those aspects of the water.

Rule/Tier 1: The Basic "Floor"

- Cannot allow loss of any existing use*
- Cannot allow water quality to drop below levels needed to maintain existing use
- Applies to all waters, regardless of use designation

*** In the context of antidegradation, "existing use" means a current or actual use**

Rule/Tier 2: Use of Assimi-lative Capacity Is Not a Right

- "Brakes" slide from really good WQ to barely at WQS, by saying you can't degrade WQ unless:
  - Point sources are meeting relevant technology-based limits
  - Have "achieved all cost-effective and reasonable best management practices for nonpoint sources"
  - Allowing lower WQ is "necessary to accommodate important economic or social development"
  - Gone through public review and comment

Is Tier 2 Antidegradation being vigorously implemented in your EPA region, state, or watershed? Is particular emphasis being placed on the provision regarding BMPs and nonpoint sources?

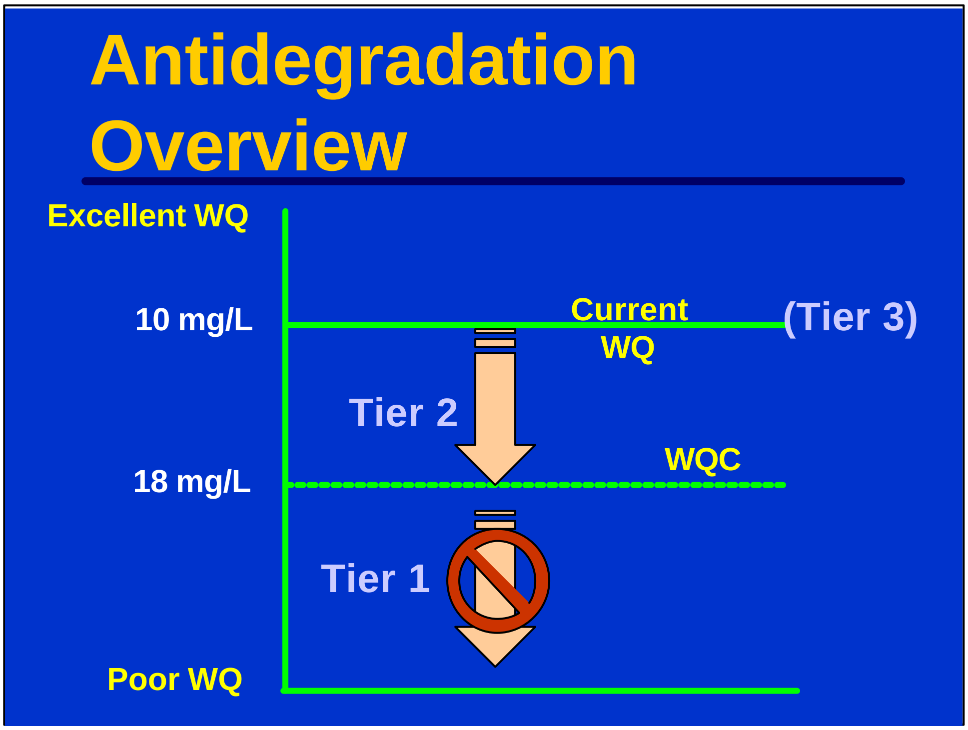
- Tier 2 prevents an allowance of a "freefall" from waters exceeding WQS to just barely meeting them. For example, if the actual dissolved oxygen (DO) in a waterbody is 8 mg/L, and the WQC is 5 mg/L, a potential point source discharger does not have a right to get permit to discharge oxygen-consuming materials in quantities that would lower the DO down to 5.1 mg/L.
- Note that neither EPA nor most states have provided precise definitions of "important economic development" or "important social development." One applies the "important development" test only when the second and 3rd sub-bullets have been met.
- It is important to note the requirement to have achieved all cost-effective and reasonable BMPs for nonpoint sources. Note again, neither EPA nor most states have provided precise definitions of "cost-effective" or "reasonable."

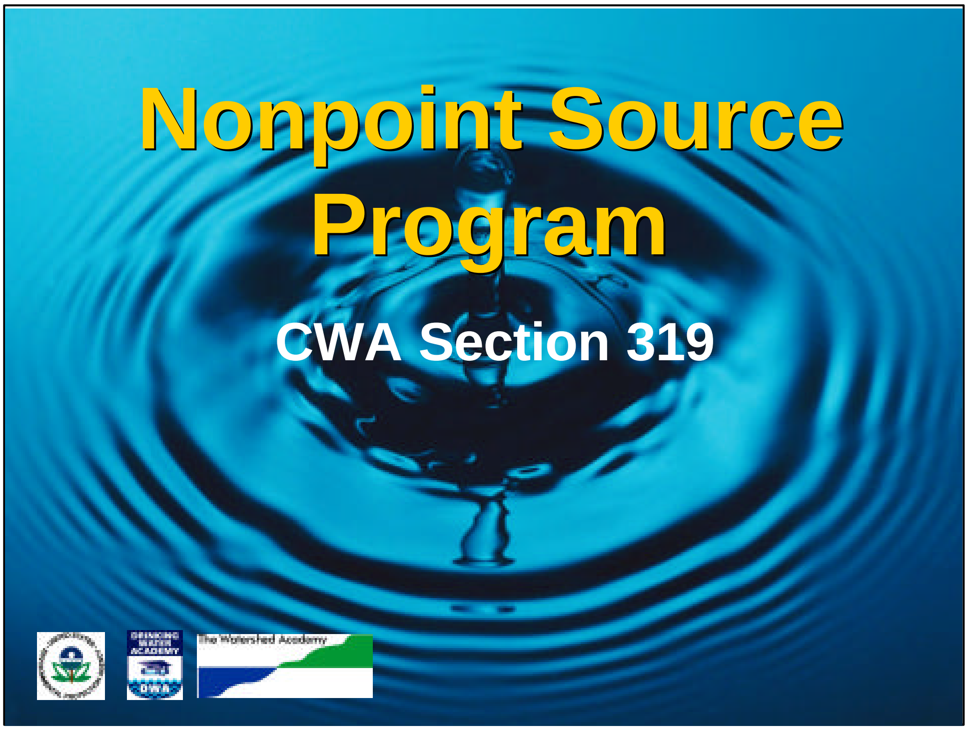
Rule/Tier 3: No Decline in Water Quality

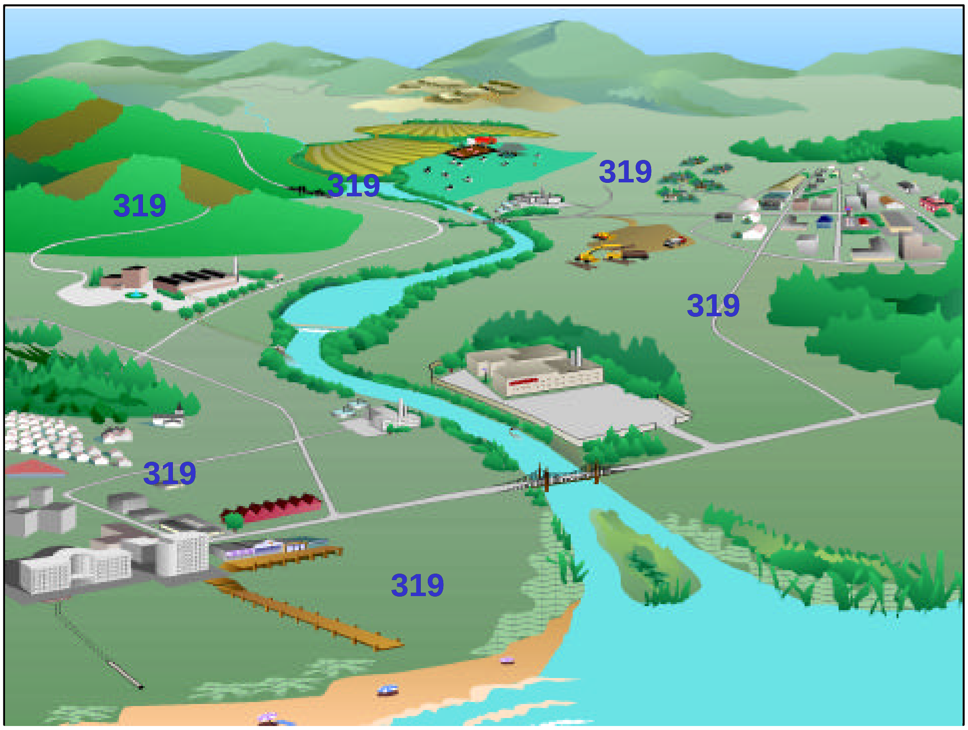
- Applies only to waters classified as Outstanding National Resource Waters
- This classification overlays designated uses
  - Candidates include, but are not limited to, "waters of National and State parks and wildlife refuges and waters of exceptional recreational or ecological significance"
- Only minimal, or significant but short-term, decreases in WQ are allowed

Are there any Tier 3 waters in your area? Are you aware of any so-called Tier 2 ½ waters, which some States have adopted to allow more flexibility than provided by Tier 3?

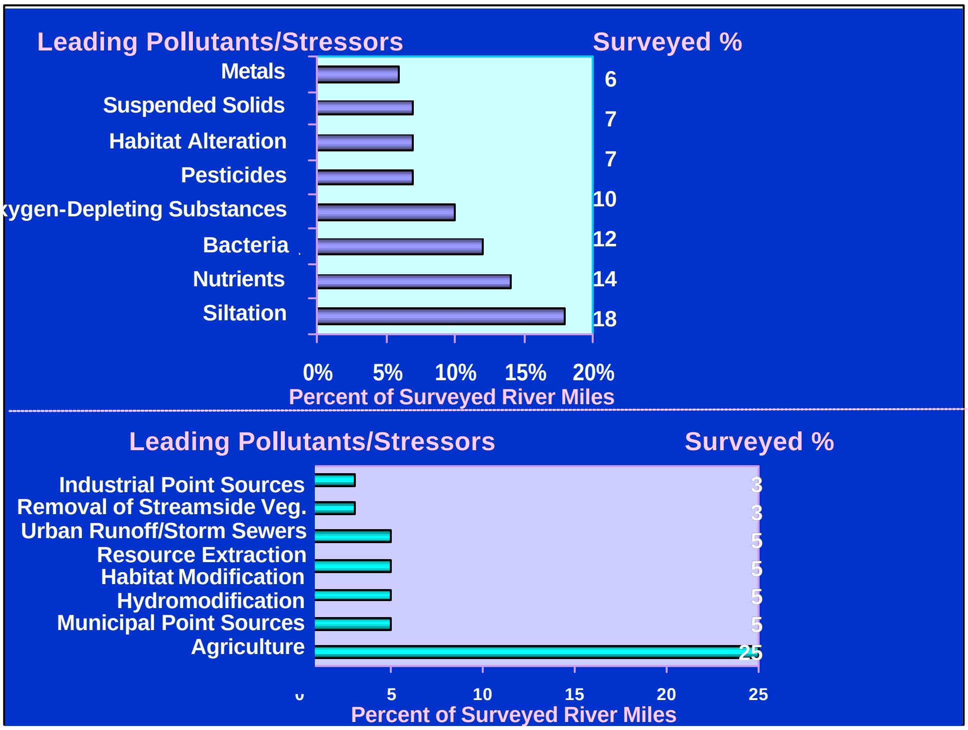
- Tier 3 only applies to waters a State has designated an Outstanding National Resource Water.
- National and state parks, wildlife refuges, and waters of exceptional recreational or ecological significance are merely suggestions that EPA has provided regarding the kinds of waterbodies which States might choose to designate for Tier 3.


Antidegradation Overview
Excellent WQ
10 mg/L
Current WQ
(Tier 3)
Tier 2
18 mg/L
WQC
Tier 1
Poor WQ


Nonpoint Source Program
CWA Section 319



- Let's turn now to polluted runoff, which is the subject of Section 319 of the Clean Water Act. What are some potential sources of polluted runoff might be in this diagram?



- EPA does not have a regulatory program for nonpoint source pollution, even though it represents the most significant source of pollution overall in the country, as the graphs above show. Nonpoint source pollution is addressed through a number of programs that stress informed, voluntary compliance with best management practices.

§319: Nonpoint Source (NPS) Program

- State or Tribal NPS management programs
- Federal grants to States and Tribes

- State NPS programs are mostly funded by Federal grants. Under the Clean Water Act section 319, States and delegated Tribes are required to develop nonpoint source pollution management programs.

State NPS Management Programs

- States, territories, and tribes
- Identify waters impaired or threatened by nonpoint sources
- Short- (< 5 years) and long-term goals for NPS program
- Identify key categories of NPS: estimate total loadings from each category
- Best management practices useful with each key category

- The components of the plans are fairly straightforward, and parallel requirements of other water quality approaches. States and tribes must identify waters that are impaired or threatened by nonpoint sources of pollution, develop short and long-term goals for cleaning them up, and identify the management practices that will be used to do so.
- Identification of impaired or threatened waters usually involves a review of the biennial State's water quality report described under section 305(b) of the Clean Water Act and identifying waters that are impacted by nonpoint sources. Goals are mostly articulated as attempts to meet the water quality criteria for the designated uses of the water body.
- The BMP section is more difficult, and requires a thorough analysis of the type of stressors, the sources of those stressors, and the types of BMPS that will be both effective and affordable in addressing the identified stressors.

State NPS Management Programs

- Programs to ensure use of BMPs
  - Cost-sharing, technical assistance, land purchase and easements, regulations
  - State-wide or reservation-wide baseline plus targeting of key areas (e.g., TMDLs)
  - Address both impaired and threatened waters
  - Can address ground water, in addition to surface water

- BMP programs range from educating timber harvest workers on road building and riparian zone protection techniques and agricultural soil and water conservation practices to cost-sharing practices designed to control sediment, oil and grease, and other pollutants in runoff.

- The NPS section of the CWA really relies on a watershed approach and the involvement of multiple partners to address pollutant issues. For example, the Natural Resources Conservation Service (NRCS) of the U. S. Department of Agriculture is an extremely valuable partner in farm country, since NRCS has access to technical staff and some cost-share funding under the Conservation Reserve Program and the Environmental Quality Improvement Program.
- The State NPS programs must also have a monitoring and evaluation plan, which is usually tied into the State §305(b) assessment and reporting program.

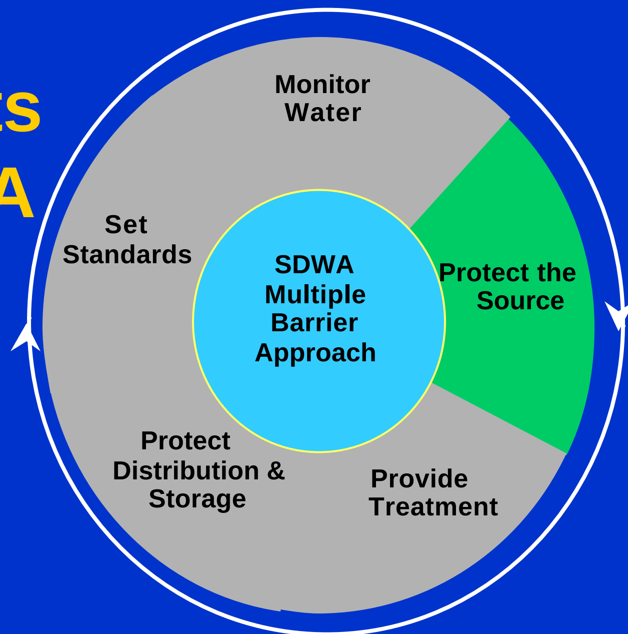
NPS Newsletters and Listservs

- NPSINFO E-mail Listserver – forum for open discussion of nonpoint source pollution issues
- EPA Nonpoint Source News-Notes- a periodic report on the condition of the water-related environment and the control of nonpoint sources of water pollution

To subscribe, go to www.epa.gov/owow/nps/pubs.html

- SDWA uses many tools to implement the multiple barrier approach. This section will discuss tools to protect the source of drinking water.

Key Elements of SDWA



Selecting A Source of Drinking Water

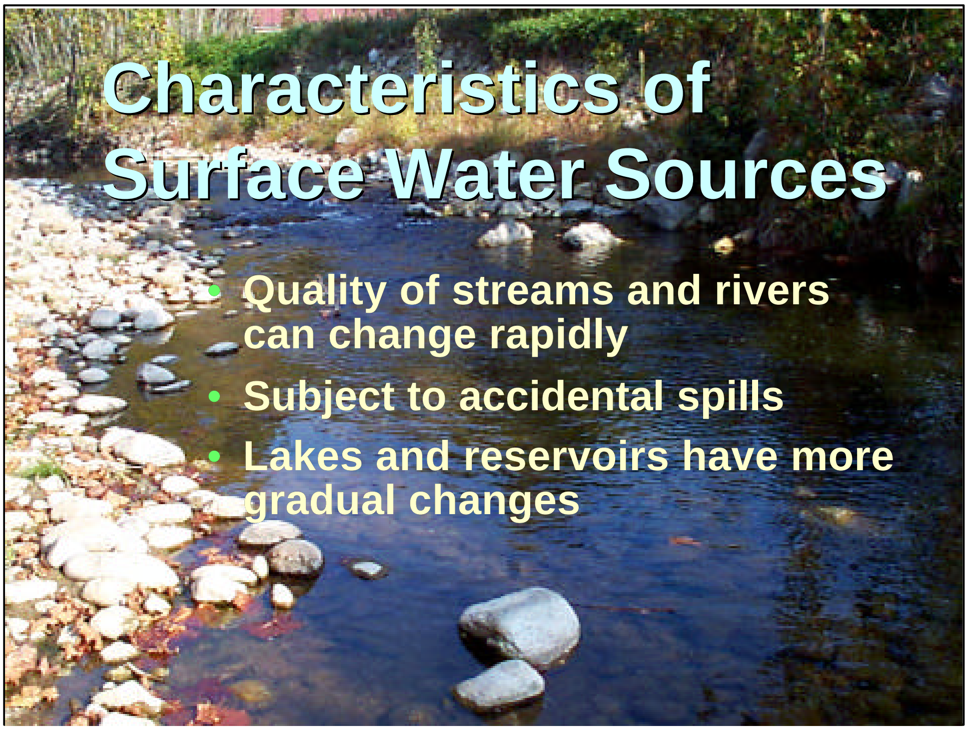
- Adequate quantity
- Meets requirements for microbiological, physical, chemical and radiological quality
- Best available source economically reasonable and technically possible

- In selecting the source of water to be developed, the water system must select a source with an adequate quantity of water, that will meet the current requirements of the regulating authority with respect to microbiological, physical, chemical and radiological qualities. Each water supply should take its raw water from the best available source that is economically reasonable and technically possible.

Surface Water Sources

- Quantity
  - Adequate to meet water demand
  - Provide reasonable surplus for growth
  - Adequate to compensate for silting, evaporation and other losses
  - Adequate for other legal users of the source
- Quality – assess:
  - Possible future uses
  - Degree of control
  - Degree of hazard (accidents and discharges)
  - Sample quality

- ***Surface water supplies*** are developed from streams, lakes, rivers, or impounding reservoirs. A surface water source includes all tributary streams and drainage basins, and natural lakes and artificial reservoirs or impoundments above the point of water supply intake.
- The ***quantity of the water*** at the source must:
  - o Be adequate to ***meet the maximum projected water demand*** of the service area shown by calculations based on the extreme drought of record while not significantly affecting the ecology of the water course downstream of the intake;
  - o Provide a ***reasonable surplus*** for anticipated growth;
  - o Be adequate to ***compensate for silting***, evaporation, seepage and other losses; and
  - o Be adequate to provide ***ample water for other legal users*** of the source.
- The water system should conduct a ***sanitary survey*** of the factors, both natural and manmade, that may affect quality. This should include:
  - o Determining possible future uses of impoundments or reservoirs;
  - o Determining the degree of control of the watershed by the owner;
  - o Assessing the degree of hazard by accidental spillage or from point or nonpoint discharges of materials that could affect the water supply or treatment processes;
  - o Obtaining samples over a sufficient period of time to assess the microbiological, physical, chemical and radiological characteristics of the water;
  - o Assessing the capability of the proposed treatment process to reduce contaminants to meet applicable standards; and



- The location and elevation of the water source may offer the advantage of gravity flow to the treatment facilities. Surface water supplies always require some type of treatment.
- ***Streams or rivers*** have the characteristic of ***rapid changes in water quality***. During heavy rains or spring runoff, changes in turbidity and other constituents require flexible and reliable treatment processes and close operator attention. In addition, rivers and streams are more susceptible to accidental spills and transport of contaminants into the treatment plant. Consequently, treatment process selection should consider the occurrence of such events.
- ***Lakes and impounding reservoirs*** have the characteristic of ***seasonal changes*** in water quality, but these changes are more gradual and less dramatic than those of streams and rivers. During summer months a lake may stratify into distinct layers such that warmer water stays near the surface and cooler water is trapped below with little intermixing. This condition can lead to oxygen depletion at lower depths. Under these conditions, iron and manganese can become solubilized. Taste and odor problems may also increase because of release of anoxic and/or anaerobic decay products and hydrogen sulfide.
- Upper lake levels are susceptible to algal blooms if carbonate, nutrient, and temperature conditions are favorable. Algal blooms can cause changes in source water turbidity, alkalinity, taste, odor, pH, and other characteristics.

Ground Water Sources

- **Quantity**
  - Equal or exceed design maximum and average day demands with largest producing well out of service
  - Minimum of two sources
  - Standby power supply
- **Quality**
  - Every new, modified or reconditioned ground water source must sample to demonstrate quality
  - Adequate separation between well and potential sources of contamination and ground water development

Artesian well

- ***Ground water supplies*** are developed by constructing wells, galleries, and ranney collectors, or by collecting spring water. A ground water source includes all water obtained from dug, drilled, bored or driven wells, and infiltration lines.
- The total developed ground water source capacity must equal or exceed, with the largest producing well out of service:
  - o Design maximum day demand; and
  - o Design average day demand.
- A minimum of ***two sources of ground water*** must be provided.
- To ensure continuous service when the primary power has been interrupted, a standby power supply must be provided.
- After disinfection of every new, modified or reconstructed ground water source, there must be one or more samples with satisfactory microbiological analysis results before placing the well into service.
- Every new, modified or reconditioned ground water source must be examined for physical and chemical characteristics and radiological activity by tests of a representative sample, with results reported to the regulatory agency.
- The well location should be selected to minimize the impact on other wells and other water resources by selecting a location with adequate separation between existing and potential sources of contamination and ground water development.
- Continued sanitary protection of the well site from potential sources of contamination must be provided either through ownership, zoning, easements, leasing or other means.

Characteristics of Ground Water Sources

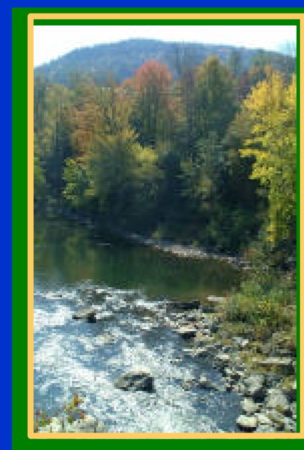
- Seasonal quality is relatively constant
- Quality may vary greatly from well to well
- Usually superior to surface water:
  - Bacteriological content
  - Turbidity
  - Total organic concentrations
- Mineral content may be inferior to surface water sources

Well being drilled

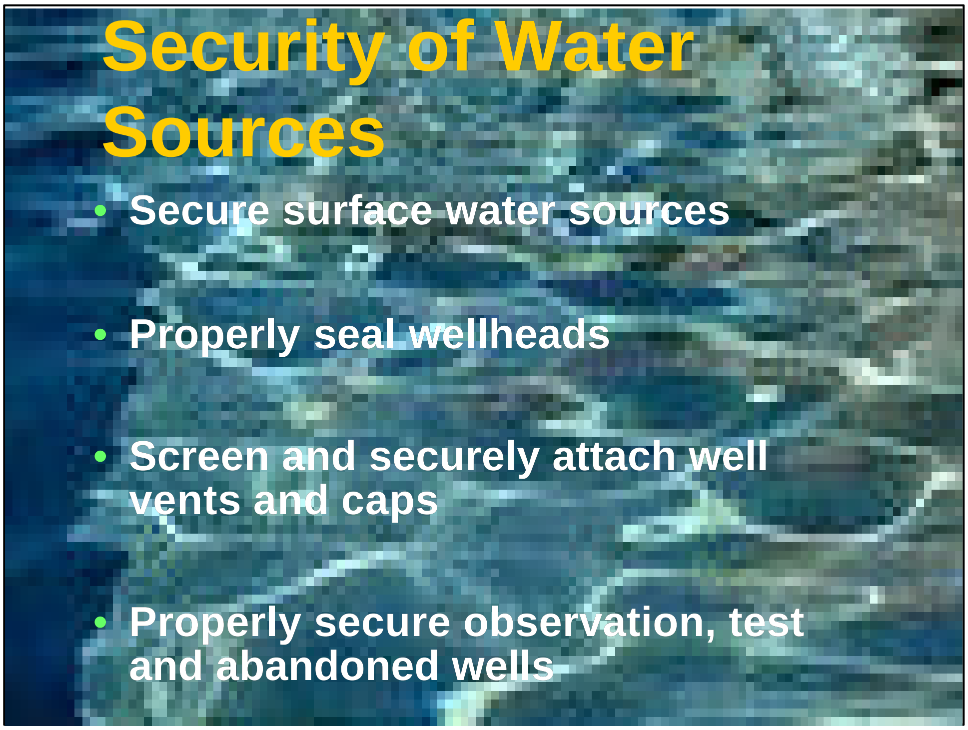
- ***Ground water is relatively constant in quality*** from season to season. However, ground water supplies may be highly variable in quality form one well location to another. Changes in hydrogeological conditions can produce different water quality over a relatively short distance.
- ***Ground water quality is usually superior to that of surface water***, with respect to bacteriological content, turbidity, and total organic concentrations. On the other hand, mineral content (hardness, iron, manganese) of ground water may be inferior and require additional treatment. Ground water supplies are frequently pumped into the distribution system with minimal treatment.

Protecting the Source

- Security
- Sole source aquifer program
- Wellhead protection program
- Source water assessments
- Underground injection control



- After selecting an appropriate source, the water system must provide for continued protection. SDWA has historically included provisions to protect drinking water sources. The 1974 statute included the sole source aquifer program and the underground injection control program. The 1986 Amendments added wellhead protection. The 1996 Amendments added a major new program: source water assessments.
- Whether a public water system relies on surface water, ground water, or a combination of the two, protection of a water system's source is important. Source protection minimizes the effect of human activity (e.g., sewage production, farming, and industry) on surface water and ground water.
  - o If source water becomes contaminated, threats to public health are increased.
  - o In addition, expensive treatment or replacement or relocation of the water supply may be required. Treatment or relocation costs are passed on to every user served by the public water system and local property values may be reduced.
  - o Water is a limited resource. If a source becomes contaminated, there may not be another source available that can be developed.
- Protection of existing sources of water is a prudent way to protect public health and keep treatment costs to a minimum. Many management measures are available to prevent pollution, control contaminants at the source, or treat wastewater before it is discharged.
- Selection of management measures is based on a variety of factors, including the physical properties of the watershed (annual precipitation, soil type and drainage, ground water and surface water hydrology, and space limitations), land uses and potential contaminants, type of contamination problem (e.g., point source or non-point



- The events of September 11, 2001, raised awareness of the need to ensure the safety and security of our water supplies.
- Surface water supplies present the greatest challenge. Typically they encompass large land areas. Where areas cannot be secured with fencing, steps should be taken to initiate or increase law enforcement patrols where possible. Particular attention should be paid to surface water intakes. A critical element in security of these types of areas is the enlistment of the eyes of the public to be vigilant about suspicious activity.
- A properly sealed wellhead and properly installed vents and caps decrease the opportunity for introducing contaminants into the water supply.
- All observation, test and abandoned wells should be properly capped or secured to prevent introduction of contaminants into the aquifer or water supply.

Sole Source Aquifer Program

- Sole source aquifer provides at least 50 percent of the drinking water to affected area
- EPA reviews petitions for SSA designation
- EPA reviews Federally-funded projects that may contaminate SSAs

- The ***sole source aquifer program*** is authorized under section 1424(e) of SDWA. No Federal financial assistance may be provided for any project that may contaminate an area designated as a sole source aquifer (SSA).
- A sole source aquifer is one that ***supplies at least 50 percent of the drinking water*** consumed in the area overlying the aquifer. These areas can have no alternative drinking water source that could physically, legally and economically supply all those who depend on the aquifer for drinking water.
- Any person may ***petition for a designation***. "Person" is defined as an individual, corporation, company, association, partnership, State, municipality, or Federal agency. A petitioner must supply adequate technical information (such as hydrogeologic and water usage information) to allow EPA to make a judgment.
- Proposed projects with Federal financial assistance that have the potential to contaminate SSAs are subject to EPA review. This review is coordinated with National Environmental Policy Act (NEPA) reviews and with relevant Federal, State and local agencies. Examples of projects that might be subject to review include highways, wastewater treatment facilities, construction projects that involve storm water disposal, public water supply wells and transmission lines, agricultural projects that involve the management of animal waste, and projects funded through Community Development Block Grants.
- One example of how the SSA review can affect a project is seen in EPA's review of a proposed gas station and convenience store in a SSA area in Idaho. EPA recommended that the gasoline storage tanks needed proper certification and installation and grassed retention basins for treating storm water runoff before it infiltrated the subsurface. EPA worked with the project proponent, architects, and engineers to design the basins and incorporate an underground oil/water separator tank to treat any large petroleum spills before the effluent is discharged to the grassed retention basins. The subsequent gas station design substantially minimized the impact to ground water quality.

Wellhead Protection

- Protection of ground water sources
- Authorized by SDWA Section 1428 of the 1986 amendments
- EPA-approved, State-designed wellhead protection plans can receive Federal funding to protect ground water sources
- Requirements for Federal compliance

- Section 1428 of the 1986 SDWA Amendments created the ***wellhead protection*** (WHP) program, which offered communities a cost-effective means of protecting vulnerable ground water supplies. This program does not address surface water supplies.
- The 1986 Amendments required each State to submit a comprehensive State wellhead protection plan to EPA within three years. EPA reviewed the State-proposed wellhead protection programs; if a program was disapproved, the State could not receive Federal funds to implement its program. Congress believed that this enabled EPA to direct the use of scarce Federal dollars in the most effective way, while letting States continue to pursue their preventative programs. Currently, 49 States and two Territories have EPA-approved WHP programs.
- To establish wellhead protection programs, communities delineate vulnerable areas and identify sources of contamination. Through regulatory or non-regulatory controls, local officials and volunteers manage contamination sources and protect their water supply, as well as plan for contamination incidents or other water supply emergencies.
- SDWA section 1428(h) specifically requires Federal agencies to comply with State wellhead protection programs to the same extent as any other person, including payment of reasonable charges and fees.

Source Water Protection

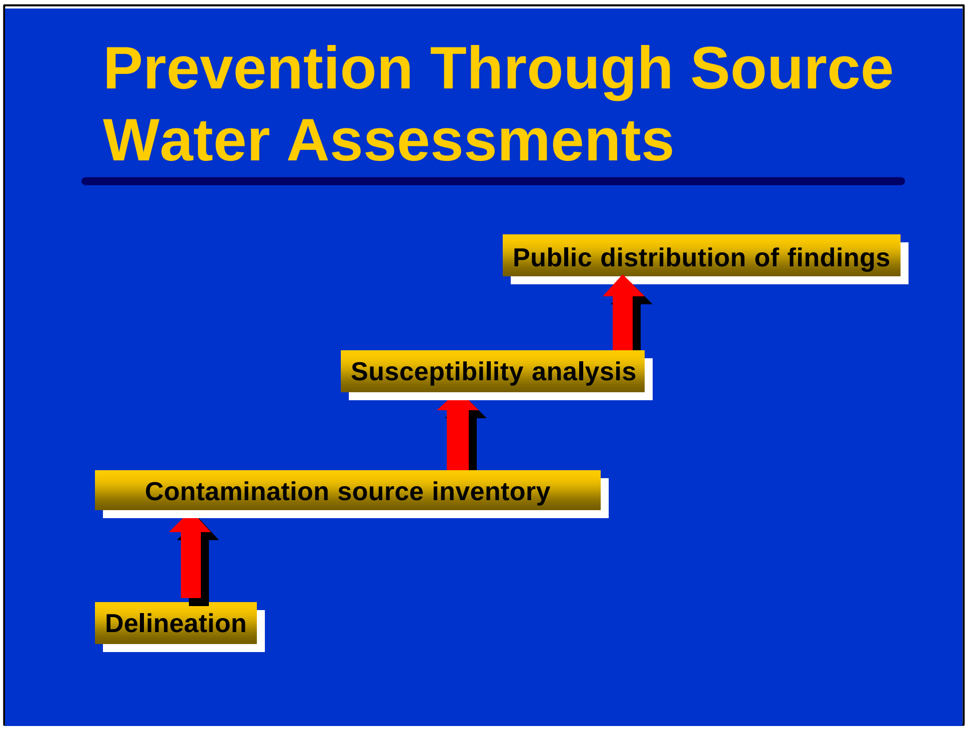
- What constitutes a source water protection area?
- What protection is provided?
  - **Watershed protection** for surface water sources
  - **Wellhead protection** for ground water sources

- Whether a public water system relies on surface water, ground water, or a combination of the two, protection of a water system's source is important. Prevention of contamination is one of the most cost-effective methods of ensuring safe drinking water supplies. If source water becomes contaminated, expensive treatment or replacement of the water source may be required before safe drinking water can be delivered to users. Treatment costs are passed on to every user served by the public water system. It is prudent to protect source water before contamination occurs.
- Among the key provisions of the 1996 Amendments was the ***Source Water Protection Program***, which includes measures to identify and protect all sources (both surface water and ground water) of drinking water.
- A ***source water protection area*** is the watershed or ground water area that may contribute pollution to the water supply. The entire area needs to be protected in order to minimize pollution of the source water.
  - A ***wellhead protection area*** is the area surrounding a drinking water well or well field (area containing one or more drinking water wells that produce a usable amount of water) that is protected to prevent contamination of the wells. This area includes the "recharge zone," which is the land area that replenishes the aquifer.
  - A ***watershed*** is the land area from which water drains into a stream, river, or reservoir. A ***watershed protection area*** is the portion of the watershed that is protected to prevent contamination of the surface water source. A watershed protection area may include wellhead protection areas since protection of surface water sources may encompass areas that recharge a ground water well.

Why Protect Source Water Areas In This Way?

- Why doesn't the Federal government just buy all the land surrounding water supplies?
- Why don't States just buy all the land surrounding water supplies?
- Why not regulate all discharges to ground and surface water?

- The source water protection program is not a Federal regulatory program.
- Land use is a State and local issue. The Federal government has limited authority over land use.
- Private land is not easily appropriated for public purposes:
  - Owners must be fully compensated; and
  - The issue of "takings" is legally complicated.
- Regulation of discharges is increasing, but regulation of all discharges is not practical nor does science provide sufficient evidence of the risk required for regulation.



- The Amendments added Section 1453, which requires PWSS primacy States to develop comprehensive Source Water Assessment Programs (SWAPs). All States were required to submit their SWAP plans to EPA by February 6, 1999. EPA has approved 52 SWAPs. All States are working toward the 2003 goal of completing an assessment for every public water system--for major metropolitan areas and the smallest towns, including schools, restaurants, and other public facilities that have wells or surface water supplies. Assessments will not be conducted for drinking water systems that have less than fifteen service connections or that regularly serve less than twenty-five individuals, since these are not considered public water systems. Assessments do not include Federal requirements to monitor source water.
- States must perform source water assessments for all public water systems. These assessments can be done on an "area-wide" basis involving more than one PWS. To be considered complete, a local source water assessment must include four components:
  - o Delineation of the ***source water protection area*** (SWPA), the portion of a watershed or ground water area that may contribute pollution to the water supply.
  - o Identification of all significant potential sources of drinking water contamination within the SWPA. The resulting ***contamination source inventory*** must describe the sources or categories of sources of contamination either by specific location or by area.
  - o Determination of the water supply's susceptibility to contamination from identified sources. The ***susceptibility analysis*** can either be an absolute measure of the potential for contamination of the PWS or a relative comparison between sources within the SWPA.
  - o ***Distribution*** of the source water assessment results to the public.

Non-Regulatory Source Water Protection Program

- Management techniques to protect sources based on source water assessments
- State and local regulatory authorities
- State and local non-regulatory programs
- Funded by Drinking Water State Revolving Fund

- Once completed, source water assessment results can be used to focus prevention resources on drinking water protection. EPA strongly encourages linking the source water assessments to implementation of source water protection programs. ***The Source Water Protection (SWP) Program is a non-regulatory program at the Federal level.***
- Much of the ***actual implementation of SWP occurs at the local level***. A local SWP effort hinges on three key steps: 1) assembling a local SWP team, 2) identifying and implementing management measures, and 3) contingency planning.
- Communities should assemble a local team to guide source water protection activities. This team should include at least one representative of the PWS as well as local citizens or citizen groups such as retired volunteers.
- After the initial source water assessments are complete, EPA recommends that they be reviewed and updated periodically to address regulatory changes or new activities in the source water protection area.
- Federal funding for State source water programs is available through the Drinking Water State Revolving Fund, which will be discussed later in the course.

Source Water Protection and the Clean Water Act

- Water quality standards
- NPDES permits
- Nonpoint source program
- TMDLs
- Section 404 permits
- Integration through the "watershed approach"

- SDWA and the CWA intersect in protecting surface water used as drinking water. The watershed approach advocated by the Office of Water in the CWA context parallels SDWA's approach to protection of source water. They both provide a framework for environmental management that focuses on addressing problems within hydrologically-defined geographic areas.
- Many opportunities exist for combining efforts and resources to jointly implement CWA programs and source water protection programs that fall under SDWA. CWA programs could provide funding, program support, or information to support source water assessments or promote local SWPPs, or vice versa.
- CWA programs have broad-based goals (to protect water for aquatic life, wildlife, and certain human uses, including water supply for human consumption), while SDWA programs focus on water for human consumption. However, CWA programs such as the water quality standards, non-point source, TMDL, NPDES permits, and section 404 wetlands programs can directly or indirectly protect sources of drinking water.
- Although none of the programs can alone entirely protect a drinking water source, each has the potential to play a role in a comprehensive watershed protection strategy.

Underground Injection Control Program

- Designed to protect underground sources of drinking water
- Very much a water pollution control program
  - Addresses ground water, which is typically not protected by the CWA

- Regulations under the ***underground injection control*** (UIC) program are intended to protect ***underground sources of drinking water*** (USDWs).

What is an Underground Injection Well?

- **Well:** A bored, drilled, or driven shaft, or a dug well or dug hole where the depth is greater than the largest surface dimension; or an improved sinkhole; or a subsurface distribution system

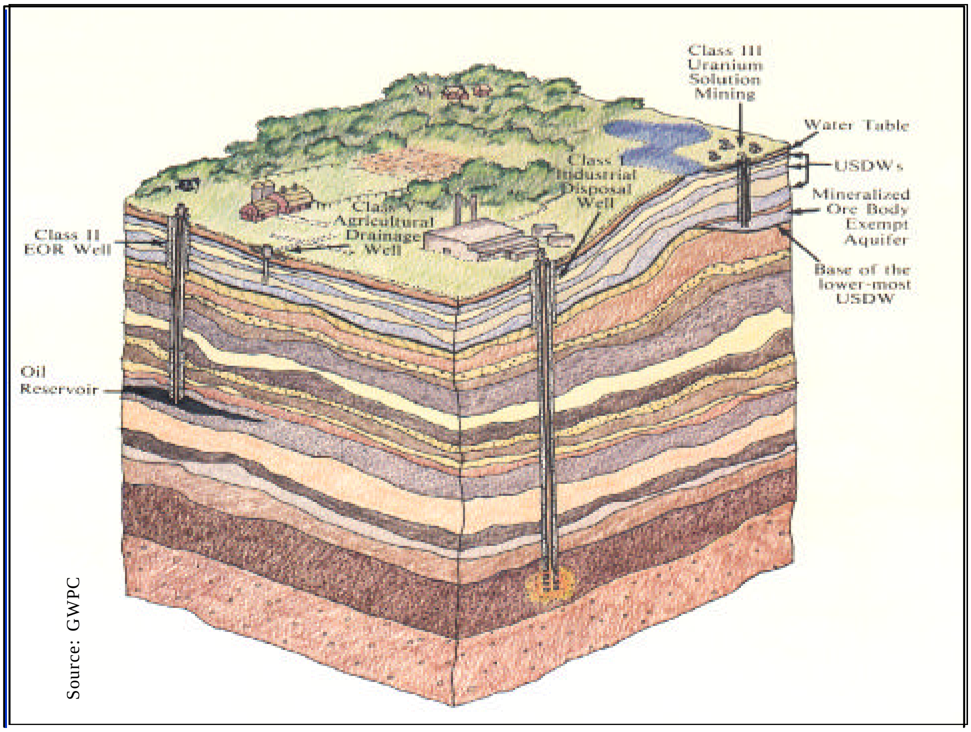
- **Underground injection:** Subsurface emplacement of fluids through a well

- The Safe Drinking Water Act (SDWA) is the primary statute that governs injection wells. During deliberations for SDWA in 1974, Congress recognized the existence of a wide variety of injection wells, and struggled to provide a statutory definition that might include all possible injection types and practices. Congress included the "deeper than wide" specification in order to distinguish injection wells from pits, ponds, and lagoons, which were the subject of a different Federal initiative.
- Thus, injection through a well is defined as the subsurface emplacement of fluids through a bored, drilled, or driven well or through a dug well where the depth of the dug well is greater than the largest surface dimension; or a dug hole whose depth is greater than the largest surface dimension; or an improved sinkhole; or a subsurface distribution system.

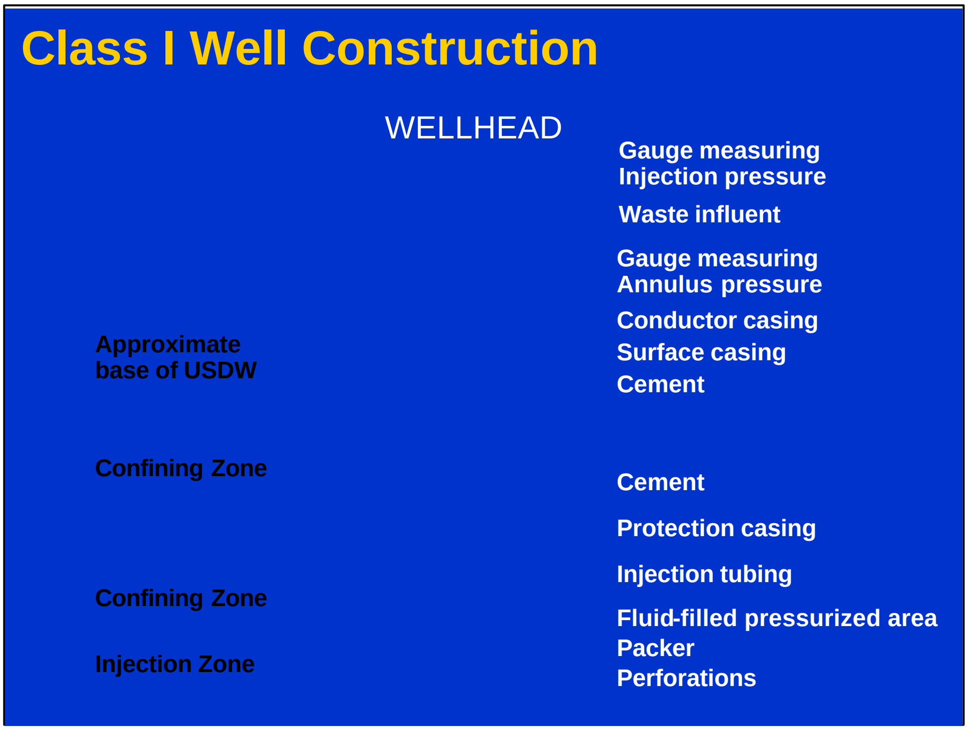
Authorization by Rule and Permitting

- Some wells may be authorized by rule: permit not required if they meet basic requirements
- Some well owners or operators must apply for permits to drill and to operate
- All wells must submit inventory data
- All wells are subject to non-endangerment standard

- Some regulations are ***self-implementing***. Regulations of this type require little or no additional interpretation. The requirements are generally applicable, not site-specific. For example, MCLs under SDWA are self-implementing. Public water systems are expected to read and implement the requirements as written. In those instances where EPA considers site-specific conditions to be important (e.g., system size or type), any variation in the requirement is spelled out in the regulations.
- Some UIC standards are self-implementing. Wells subject to such standards are considered to be "***authorized by rule***" or "***rule-authorized***." When a well is ***authorized by rule, it means that the owner/operator does not have to apply to EPA or the State for a permit as long as he complies with the requirements of the rule***.
- Other standards, however, must consider site-specific conditions and are implemented through a permit (or enforcement order). They require consideration of the specific conditions and circumstances at a site (e.g., geology and hydrogeology, input parameters, environmental setting) in order to determine the appropriate application of the regulations.
- ***Some UIC well types require a permit*** to drill before the well may be installed, and a permit to operate before the well may be used. The owner or operator must apply for a permit from EPA or the primacy State. The permit application requirements, as well as ***conditions imposed in a permit, vary based on the type of well, material injected, geology of the area and other factors.***
- Owners or operators of all UIC wells, whether the well is subject to permitting or is authorized by rule, are ***required to submit basic inventory information*** to the appropriate regulatory agency. Additionally, ***all wells are prohibited from endangering USDWs, known as the "non-endangerment standard".***



- EPA believes that there are more than 800,000 injection wells presently operating. There are a wide variety of injection well designs and uses. The injectate, purpose, construction, operation, and geologic setting for wells varies widely. EPA concluded that the degree of endangerment posed by these wells also varies, based on these factors. EPA categorized injection wells based on common characteristics, and in June 1980 promulgated a regulatory system based on ***five*** classes of wells.
- ***Class I wells*** are technologically sophisticated wells that inject large volumes of hazardous and non-hazardous wastes into deep, isolated rock formations that are separated from the lowermost USDW by many layers of impermeable clay and rock. Class I wells injecting hazardous waste must have at least ***three*** confining zones and a saline aquifer between the injection zone and the base of USDWs.
- ***Class II wells*** inject fluids associated with oil and natural gas production into related zones ***beneath*** the base of USDWs. Most of the injected fluid is brine produced when oil and gas are extracted from the earth (about 10 barrels for every barrel of oil).
- ***Class III wells*** inject super-hot steam, water, or other fluids into mineral formations ***beneath*** USDWs that dissolve the minerals and are pumped to the surface and the minerals extracted. Generally, the fluid is treated and reinjected into the same formation. More than 50 percent of the salt and 80 percent of the uranium extraction in the U.S. is produced this way.
- ***Class IV wells*** inject hazardous or radioactive wastes ***into*** or ***above*** USDWs. These wells are banned under the UIC program because they directly threaten the quality of underground sources of drinking water.
- ***Class V wells*** use injection practices that are not included in the other classes. Some Class V wells are technologically advanced wastewater disposal systems used by industry, but most are “low-tech” holes in the ground. Generally, they are shallow and depend on gravity to drain or inject liquid waste into the ground above or into USDWs. Their simple construction provides little or no protection against possible ground water contamination, so it is important to control what goes into them.

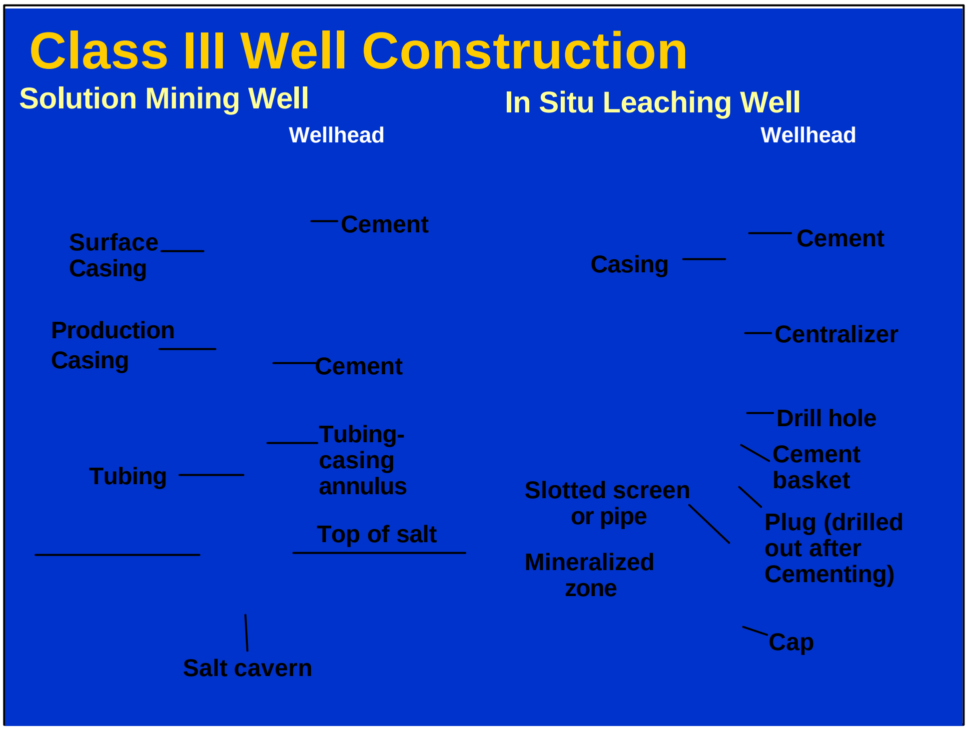


- Class I wells inject either hazardous (I-H) or non-hazardous industrial or municipal wastes (I-NH) into zones below USDWs. Class I wells are judged by EPA to present a great potential for endangerment of USDWs, and therefore receive the UIC program's highest level of regulatory attention. It is important to note that State regulations may be stricter than EPA's.
- There are 272 active Class I injection facilities nationwide. These 272 facilities maintain approximately 486 Class I injection wells in 22 States (Class I UIC Program: Study of the Risks Associated with Class I Underground Injection Wells, EPA 816-R-01-007, March 2001).
- Of these 272 facilities, 51 inject hazardous waste. The chemical, petroleum, and steel industries use most of the Class I hazardous waste injection wells in the country. The geology of the Gulf Coast, Great Lakes and Florida peninsula is best suited for these types of wells. Ten States have Class I hazardous waste injection wells; Texas has the most.
- The key requirement for Class I wells is continuous monitoring of internal mechanical integrity (MI). EPA requires continuous monitoring of annulus pressure for hazardous (Class I-H) and non-hazardous (Class I-NH) Class I wells, except municipal wells. Class I-H wells must also conduct at least one internal mechanical integrity test (MIT) each year, and external MIT every five years. Class I-NH wells have less stringent requirements, and must conduct both internal and external MIT every 5 years.
- Class I hazardous waste disposal wells are included in the definition of land disposal units that require regulation under Section 3004(k) of RCRA. Wells injecting hazardous waste must submit and receive approval for a petition under RCRA demonstrating that wastes will remain in the injection zone for as long as they remain hazardous "(no-migration petition"). The difference between this restriction and the general UIC non-endangerment standard is that violation of a primary drinking water standard is determined at the injection zone in order to demonstrate "no migration," while non-endangerment is determined at the USDW.

Class II Wells

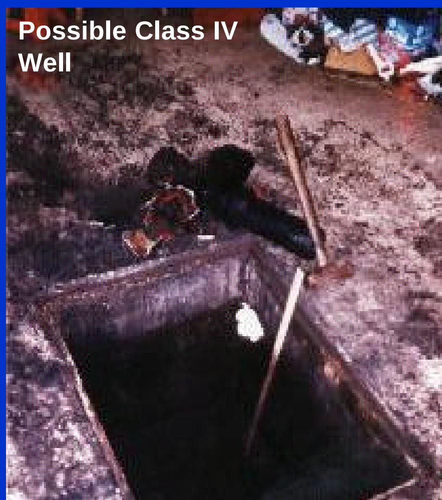
- Dispose of salt water produced with oil or natural gas
- May have multi-well area permits
- Must demonstrate mechanical integrity at least every 5 years
- Monthly monitoring of injection pressure, flow rate, and volume

- Class II wells are a necessary component of oil and gas production. More than two billion gallons of salt water associated with oil and gas production are injected daily into approximately 147,000 wells. On average, about 10 gallons of brine are produced for every gallon of domestic oil. About half of that brine is reinjected into the same oil-producing formation.
- Brine leaks might increase the salinity of USDWs, but even at low concentrations the water tastes so bad that humans cannot drink enough to be harmed. In the case of large-scale contamination, however, USDWs can be ruined as drinking water sources. Because of the nature of the injectate and the economic incentive for the operator to keep wells in good order, EPA assigns Class II wells a lesser level of regulatory attention.
- Class II well operators must conduct and pass an internal mechanical integrity test (MIT) once every five years. External MI for Class II wells is determined by evaluating the cementing records once, during permitting or file review.



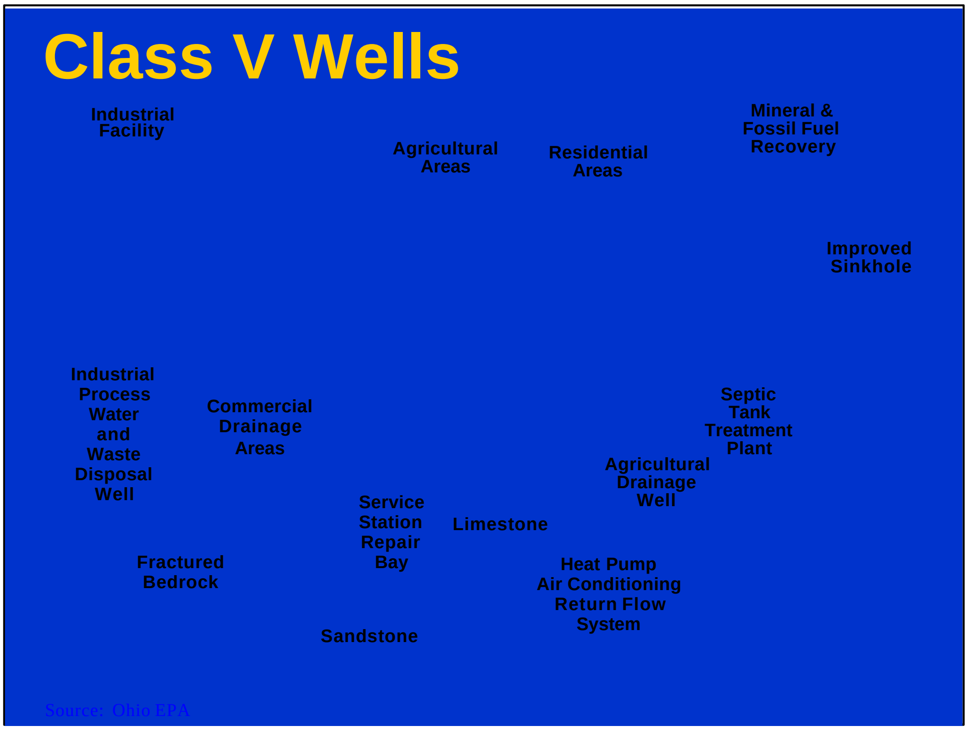
- There are two major types of Class III wells:
    - o ***Solution mining wells*** are used primarily to extract salt and sulfur from underground formations. Well operators inject water to extract salt and super-heated steam to melt and extract sulfur.
    - o ***In-situ leaching wells*** are commonly used to extract uranium, and in some instances gold and copper, from subsurface layers. A non-toxic chemical solution is circulated through the formation, which dissolves or "leaches" mineral particles from the sand grains in the ore body.
- Class III wells ***inject chemical solutions, super-hot steam, or water to recover minerals from subsurface injection zones***. Generally, ***the fluid is treated and reinjected into the same formation***. An injection-mining project may use hundreds of wells, and most wells are temporary. EPA's 1999 inventory of UIC wells indicated that 16,741 Class III wells were in existence in the U.S. More than 50 percent of the salt and 80 percent of the uranium production in the U.S. uses Class III injection wells.
- Class III mining fluids can be toxic, but because the effects from many Class III projects are temporary and because the operator has a strong economic incentive to maintain his wells, the regulations are not as stringent as those for Class I wells. Class III well owners and operators are required to conduct MIT once every five years for salt solution mining wells.

Class IV Wells



- Used to dispose of hazardous or radioactive waste into or above a USDW
- Prohibited, except for remediation under RCRA and CERCLA

- ***Class IV wells inject hazardous or industrial waste into (or above) USDWs***. This class of wells is ***prohibited***, and the classification serves only as a basis for enforcement. Regulatory attention by EPA to a Class IV well is urgent and immediate. Hazardous waste injected into USDWs provides the ***most severe potential for endangerment of human health***. Discovery of a Class IV well results in immediate enforcement proceedings. These wells are occasionally encountered, often as a result of complaints filed by anonymous workers or nearby citizens. They may also be discovered during site inspections, or during investigation of property near a contaminated public water supply.
- There is ***one exception to the prohibition*** of injecting hazardous wastes into USDWs. Some aquifer remediation projects use "pump and treat" systems that withdraw contaminated water from an aquifer, treat it to remove the hazardous constituents, and reinject it. In some cases, however, the treated water is still a hazardous waste as the treatment may not have removed the hazardous constituents to acceptable levels. Pump and treat systems often must operate for long periods of time to successfully reduce the constituents.
- EPA has decided that ***this type of beneficial injection is not prohibited if the injection takes place at an EPA-approved RCRA or Superfund remediation site and the water is returned to the same formation from which it was withdrawn***.
- Class IV wells at a site employing voluntary clean-up actions, or that fall under a regulatory program other than RCRA or CERCLA, are not eligible for the exemption and still are prohibited.



- Class V is a catch-all category—Class V wells use ***injection practices that are not included in Class I, II, III, or IV***. Some Class V wells are sophisticated injection systems used by industry, but ***most are "low-tech." Generally, they are shallow and depend on gravity to drain or "inject" liquid waste*** into the ground ***above or into USDWs.*** While some Class V wells inject below the lowermost USDW, the material injected is not an industrial or municipal waste, or these would be Class I wells.
- The ***simple construction of the majority*** of Class V wells ***provides little or no protection against possible ground water contamination***, so it is important to control the injectate.
- EPA has ***documented 650,000 Class V wells nationwide*** (The Class V UIC Study, EPA 816-R-99-014a, September 1999). They are ***located in every State except American Samoa, especially in unsewered areas*** where the population is likely to depend on ground water for its drinking water source. 40 CFR 146.5(e) identifies some types of Class V wells.
- ***Under the existing Federal regulations, most Class V injection wells are authorized by rule*** (40 CFR Part 144). The well owner or operator must submit basic inventory information to EPA or the State primacy agency and ensure that the Class V injection well is constructed, operated, and closed in a manner that protects USDWs.
- EPA promulgated a final rule on December 7, 1999 (http://www.epa.gov/safewater/c5fedreg.html), that placed a nationwide ban on new Class V motor vehicle waste disposal wells as of April 2000. It also requires phasing out existing large capacity cesspools by April 2005. The requirements for existing motor vehicle waste disposal wells are being linked with critical ground water areas, including some areas assessed through State source assessment and protection programs. All existing motor vehicle waste disposal wells in these critical ground water areas will have to be closed or permitted.

Specific Exclusions

- Injection wells on drilling platforms or elsewhere beyond State's territorial waters
- Individual or single-family residential waste disposal systems (cesspools or septic systems)
- Non-residential cesspools or septic systems if receive only sanitary waste and serve fewer than 20 people per day

- Some types of wells are excluded from regulation under the UIC program. The specific wells are listed in 40 CFR 144.1(g)(2).
- Injection wells that are part of a drilling platform or otherwise are located beyond a State's territorial waters cannot be regulated by the UIC program.
- The regulations specifically differentiate between cesspools and septic systems that serve multi-family units versus individual or single-family systems. Individual or single-family systems are exempt from the UIC regulations as long as they are truly individual or single family systems. For instance, if someone is running a business out of their basement or garage and industrial wastes are disposed into the single-family septic system, that system has now become an industrial waste disposal well.
- Additionally, non-residential cesspools or septic systems are exempt from the UIC program regulations if ***only*** sanitary waste is disposed into the system, ***and*** fewer than 20 people per day can be served by the system. For instance, the typical school would have more than 20 people per day. If this typical school were rurally located and sanitary waste was disposed through a septic system, the school is operating a Class V well. Conversely, if a building is used as an office complex, has no publicly accessible restroom facilities, and maximum tenant occupancy is 15, this building's septic system would not be regulated by the UIC program.

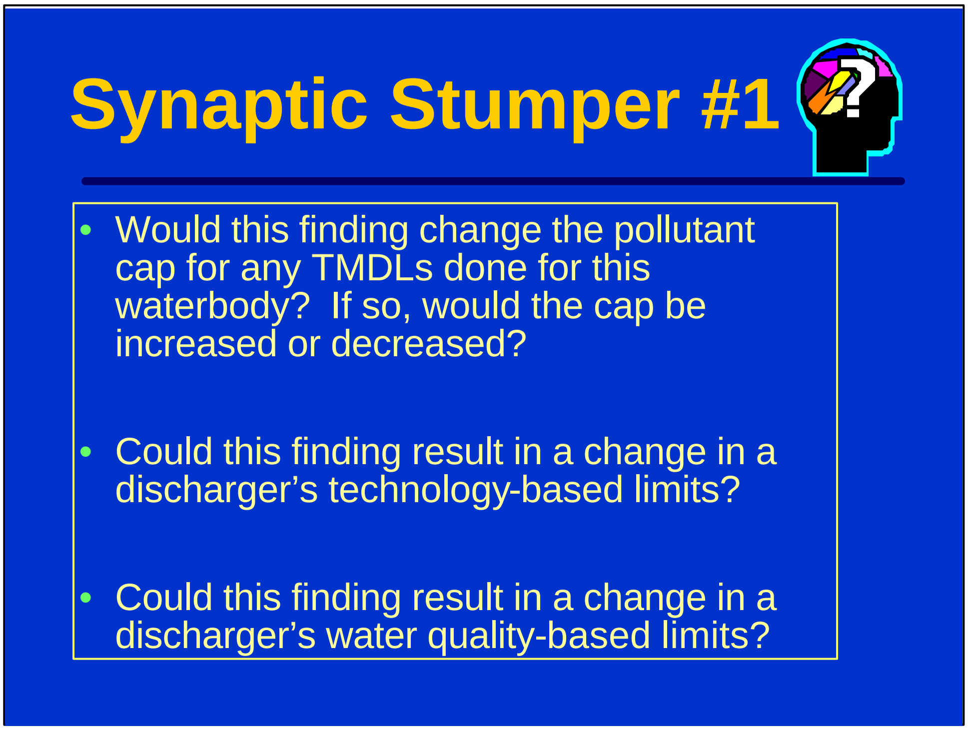
- If an injection well is used for injection of hydrocarbons that are of pipeline quality and are gases at standard temperature and pressure, and the injection of these gases is for storage purposes, the wells are not subject to UIC regulation. If the wells are used for storage of liquid hydrocarbons, however, they are regulated by the UIC program.
- Last, any dug hole that is not used for emplacement of fluids underground is exempt from the program. So, don’t think you can tell your boss you need to go do an eighteen hole shallow UIC well inspection at your local golf course!!

Synaptic Stumper #1

While studying monitoring data regarding a river, state agency staff determine that the critical low flow is 100 cfs, rather than the 150 cfs previously thought.

- Will this finding create the need to modify any of the water quality criteria for the river? If so, how?
- Might this finding change the river's impaired/unimpaired status? If so, in which direction?

- **Affect the WQC**: No, the realization that the "design flow" of the river is lower than thought would not affect the WQC, because criteria are expressed as concentrations (mass divided by volume).
- **Change impaired/unimpaired status**: Yes, with less volume of water to dilute pollutants discharged into the waterbody, the concentration would likely go up, because the mass of pollutant would not have changed, but the volume would have decreased.



- **Pollutant cap**: Yes, the lower volume of the receiving stream means the amount of acceptable load (the cap) would need to decrease, in order to meet the same in stream concentration (WQC).
- **Change in Technology-based/Water Quality-based limits**: No, technology-based limits stay the same, regardless of the volume of the receiving water, or other ambient conditions. Yes, water quality-based limits would likely become more strict, since the allowable load has decreased.

Synaptic Stumper #2a

When implementing the following provisions of the CWA, what rule applies to consideration of economics by States, Tribes or EPA: (a) must consider, (b) may consider, or (c) may not consider?

- **Issuing effluent guidelines for industries**
- **Setting WQS designated uses for waterbodies**
- **Setting WQS criteria for waterbodies**
- **Determining the loading cap component of a TMDL**
- **Determining the allocation of allowable loadings under a TMDL**

- Economic considerations:
  - o Effluent guidelines—must consider
  - o Designated uses—may consider
  - o Water quality criteria—may not consider
  - o Loading cap—may not consider
  - o Allocation—may consider

Synaptic Stumper #2b

When implementing the following provisions of SDWA, what rule applies to consideration of economics by water systems, States, Tribes or EPA: (a) must consider, (b) may consider, or (c) may not consider?

- **Setting Maximum Contaminant Level Goals (MCLGs)**
- **Setting Maximum Contaminant Levels (MCLs)**
- **Monitoring finished water**
- **Compliance with MCLs**

- Setting MCLs—must consider
- Setting MCLGs—may not consider
- Monitoring finished water—may consider
- Compliance with MCLs—may consider

Synaptic Stumper #3

A waterbody has a chronic aquatic life WQC for pollutant "X" of 16 µg/L. Recent biological monitoring indicates healthy populations of fish and other aquatic life, even though average levels of "X" in the waterbody consistently measure 25 µg/L. How might the State best handle this situation?

a. **Immediately remove the water from the 303(d) list.**

b. **Use 25 µg/L as the target, develop a TMDL.**

c. **Establish a site-specific WQC for "X" in the waterbody.**

d. **Downgrade the use classification of the waterbody, i.e., remove aquatic life.**

- **TMDL**: No.
- **If not**: WQS. May need to change the water quality criterion, assuming what has been called "natural background" is indeed natural, and not just levels that reflect current land use patterns, which may not be "natural."

Synaptic Stumper #4a

Review the limited information regarding the following fluid injection wells and make a determination. Is it likely a Class I, II, III, IV or V well?

- Well 1 is used to inject heated steam into an underground formation that is beneath known underground sources of drinking water, as part of an operation to recover sulfur.

Well 1 is a Class III well.

Synaptic Stumper #4b

- Well 2 is a shallow structure into which storm drainage flows for disposal.

Well 2 is a Class V well.

- Well 3 is located in an oil field and is used for the disposal of salt water (brine) associated with oil production by injecting the brine back into the oil producing formation.

Well 3 is a Class II well.

Synaptic Stumper #4c

- Well 4 is a drainfield for a sanitary waste-only septic system serving a small rural school attended by 15 students. There is one teacher.

  Well 4 is likely excluded from the UIC program since it receives only sanitary waste and serves fewer than 20 people.

Synaptic Stumper #4d

- Well 5 is used to inject non-hazardous municipal waste into a zone below known underground sources of drinking water.

Well 5 is likely a Class I injection well. Class I wells are considered to present the greatest potential for contamination of USDWs.

Synaptic Stumper #4e

- Well 6 is located in an abandoned industrial site. It is discovered in an area used historically for the storage of chemicals and chemical waste. It is an undefined depth and appears to have received wastes carried by precipitation or snowmelt for a period of years.

Well 6 is very likely a Class IV well. It is prohibited and should be the basis for an enforcement action to achieve proper closure.